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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/736,864

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Takahiro Iijima

CU-2417 RJS

8303

7590

10/21/2003

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EXAMINER

CHU, CHRIS C

ART UNIT

PAPER NUMBER

2815

DATE MAILED: 10/21/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/736,864

Applicant(s)

IIJIMA ET AL.

Examiner

Chris C. Chu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 July 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 - 14 is/are pending in the application.
- 4a) Of the above claim(s) 2 - 10, 12 and 14 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 11 and 13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 21 July 2003 is: a) ☒ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's amendment filed on July 21, 2003 has been received and entered in the case.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 11 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lan et al. in view of Yamaguchi et al., and further in view of Usagawa et al.

Regarding claim 1, Lan et al. discloses in Fig. 5B and Fig. 7A a multilayer interconnection substrate comprising:

- an uppermost interconnection layer (443) having a plurality of terminal pads (521A and 521C) formed at positions corresponding to a plurality of external connection

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terminals (721) provided on a semiconductor element (720) which is to be mounted on said multilayer interconnection substrate;

- a metal column (541A) formed on each of said terminal pads, and having a top surface;
- an insulating layer (441) formed on said uppermost interconnection layer so that a gap (551A) is formed between the insulating layer and an outer peripheral surface of said resin film.

Lan et al. does not disclose a resin film covering a side surface of said metal column, and having a top surface. However, Yamaguchi et al. discloses in Fig. 5 and column 10, lines 15 ~ 16 a resin film (30) covering a side surface of a metal column (28), and having a top surface; the top surface of the metal column and the top surface of the resin film covering the side surface of the metal column are formed at the same level of height; and the top surface of the metal column is surrounded by and exposed on the resin film so that the top surface of the resin film forms a pad for connection with a semi-conductor element. Thus, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to modify Lan et al. by using the resin film as taught by Yamaguchi et al. The ordinary artisan would have been motivated to modify Lan et al. in the manner described above for at least the purpose of preventing the bumps from being oxidized (column 3, lines 32 ~ 37). Furthermore, Lan et al. discloses in column 15, lines 54 ~ 56 to use an epoxy material for the insulating layer and Yamaguchi et al. discloses in column 9, lines 37 ~ 39 to use an epoxy based resin for the resin film. Thus, Lan et al. and Yamaguchi et al. disclose the following limitation “the insulating layer ... of the same material as the resin film”.

Further, Lan et al. does not disclose an upper end surface of each metal column being at the same height as an upper surface of the insulating layer. Usagawa et al. discloses in Fig. 13c an upper end surface of each metal column (30) being at the same height as an upper surface of an insulating layer (72). Thus, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to modify Lan et al. by using the resin film as taught by Usagawa et al. The ordinary artisan would have been motivated to modify Lan et al. in the manner described above for at least the purpose of decreasing manufacturing cost.

Regarding claim 11, Lan et al. discloses in Fig. 5B and Fig. 7A a semiconductor device comprising:

- a multilayer interconnection substrate which comprises
- an uppermost interconnection layer (443) having
 - a plurality of terminal pads (521A and 521C) formed at positions corresponding to a plurality of external connection terminals (721) provided on a semiconductor element (720) which is to be mounted on said multilayer interconnection substrate;
 - a metal column (541A) formed on each of said terminal pads, and having a top surface;
 - an insulating layer (441) formed on said uppermost interconnection layer so that a gap (551A) is formed between the insulating layer and an outer peripheral surface of said resin film.

Lan et al. does not disclose a resin film covering a side surface of said metal column, and having a top surface. However, Yamaguchi et al. discloses in Fig. 5 and column 10, lines 15 ~ 16 a resin film (30) covering a side surface of a metal column (28), and having a top surface; the top surface of the metal column and the top surface of the resin film covering the side surface of the metal column are formed at the same level of height; and the top surface of the metal column is surrounded by and exposed on the resin film so that the top surface of the resin film forms a pad for connection with a semi-conductor element. Thus, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to modify Lan et al. by using the resin film as taught by Yamaguchi et al. The ordinary artisan would have been motivated to modify Lan et al. in the manner described above for at least the purpose of preventing the bumps from being oxidized (column 3, lines 32 ~ 37). Furthermore, Lan et al. discloses in column 15, lines 54 ~ 56 to use an epoxy material for the insulating layer and Yamaguchi et al. discloses in column 9, lines 37 ~ 39 to use an epoxy based resin for the resin film. Thus, Lan et al. and Yamaguchi et al. disclose the following limitation “the insulating layer ... of the same material as the resin film”.

Further, Lan et al. does not disclose an upper end surface of each metal column being at the same height as an upper surface of the insulating layer. Usagawa et al. discloses in Fig. 13c an upper end surface of each metal column (30) being at the same height as an upper surface of an insulating layer (72). Thus, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to modify Lan et al. by using the resin film as taught by Usagawa et al. The ordinary artisan would have been motivated to modify Lan et al. in the manner described above for at least the purpose of decreasing manufacturing cost.

Regarding claim 13, Lan et al. discloses in Fig. 5B and Fig. 7A a semiconductor device comprising:

- multilayer interconnection substrate manufactured by
 - forming a plurality of terminal pads (521A and 521C) in an uppermost interconnection layer (443);
 - forming an insulating layer (441) on said uppermost interconnection layer;
 - forming openings (the area of 551A and 541A) in said insulating layer, the openings located at positions corresponding to said terminal pads;
 - filling each of said openings with metal particles;
 - forming a metal column (541A) in each of said openings by heating said metal particles at a temperature which melts said metal particles so as to define a metal column top surface; and
 - removing a part of said insulating layer near but not adjacent to a peripheral side of said metal column, so that a gap (551A) is formed around but not adjacent to said peripheral side of said metal column.

Lan et al. does not disclose a part of said insulating layer adjacent to said peripheral side of said metal column. However, Yamaguchi et al. discloses in Fig. 5 and column 10, lines 15 ~ 16 a part of an insulating layer (30) adjacent to a peripheral side of a metal column (28). Thus, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to modify Lan et al. by using the insulating layer as taught by Yamaguchi et al. The

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ordinary artisan would have been motivated to modify Lan et al. in the manner described above for at least the purpose of preventing the bumps from being oxidized (column 3, lines 32 ~ 37).

Further, Lan et al. does not disclose an upper end surface of each metal column being at the same height as an upper surface of the insulating layer. Usagawa et al. discloses in Fig. 13c an upper end surface of each metal column (30) being at the same height as an upper surface of an insulating layer (72). Thus, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to modify Lan et al. by using the resin film as taught by Usagawa et al. The ordinary artisan would have been motivated to modify Lan et al. in the manner described above for at least the purpose of decreasing manufacturing cost.

Furthermore, the claim 13 is product-by-process claim, even though product-by-process claim is limited by and defined by the process, determination of patentability is based upon the product itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process. In re Thorpe, 227 USPQ 964, 966 (Fed. Cir. 1985) (citations omitted). A “product by process” claim is directed to the product per se, no matter how actually made, In re Hirao, **190 USPQ 15 at 17** (footnote 3). See also In re Brown, **173 USPQ 685**; In re Luck, **177 USPQ 523**; In re Fessmann, **180 USPQ 324**; In re Avery, **186 USPQ 116**; In re Wertheim, **191 USPQ 90 (209 USPQ 254** does not deal with this issue); and In re Marosi et al., **218 USPQ 289** final product per se which must be determined in a “product by, all of” claim, and not the patentability of the process, and that an old or obvious product, whether claimed in “product by process” claims or not. Note that Applicant has the burden of proof in such cases, as the above caselaw makes clear.

Response to Arguments

4. Applicant's arguments filed on July 21, 2003 have been fully considered but they are not persuasive.

On page 4, applicant argues "the MFV disclosed in the Lan et al. reference is formed by screen printing and is different from the metal column, which is generally formed by metal-plating." This argument is not persuasive because the gist of applicant's arguments against the rejection is primarily based on the manufacturing differences between the metal column of Lan et al. and that instant invention. However, this is not an issue with respect to the claimed invention. This is because the invention, as set forth in the claims, is clearly directed to an apparatus. Nowhere do the limitations of the claims define the process in which the instant invention is to be manufactured by metal-plating. Thus, such argument clearly fails to distinguish the claimed invention from the disclosure of Lan et al.

Further, applicant argues "the Office action stated that Yamaguchi et al. disclose a metal column 28, but what is indicated by the reference sign 28 is a bump formed on a semiconductor device and is not a metal column formed in a multilayer interconnection substrate." This argument is not persuasive since it attempts to distinguish the claim from Yamaguchi et al. merely through semantics. Whether one refers to an element (28) as a metal column or a bump, there is no structural or functional difference.

For the above reasons, Lan et al. and Yamaguchi et al. disclose a metal column formed in a multilayer interconnection substrate.

Furthermore, applicant argues “the metal column is covered by a coating layer 30 which is formed of a material from the material of the insulating layer 441 shown in Fig. 5B of Lan et al. reference.” This argument is not persuasive because Lan et al. discloses in column 15, lines 54 ~ 56 to use an epoxy material for the insulating layer and Yamaguchi et al. discloses in column 9, lines 37 ~ 39 to use an epoxy based resin for the resin film. Thus, Lan et al. and Yamaguchi et al. disclose the following limitation “the insulating layer ... of the same material as the resin film”.

Finally, applicant argues “the melted solder is prevented from being filled in the gap between the resin film 206 and the insulating layer 210 which may prevent a stress relaxation effect of the metal column and the gap around the metal column ... Thus, a semiconductor element having high-density bumps can be connected.” Since applicant merely argues against the Office action by presenting additional advantages of instant invention rather than pointing out specific structural differences, the argument is not persuasive.

For the above reasons, the rejection is maintained.

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chris C. Chu whose telephone number is (703) 305-6194. The examiner can normally be reached on M-F (10:30 - 7:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.


GEORGE ECKERT
PRIMARY EXAMINER

Chris C. Chu
Examiner
Art Unit 2815

c.c.

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